

CLAIMS

- 1 1.(withdrawn) A composition comprising a modified nucleotide including a molecular
2 and/or atomic tag, where the nucleotide alters base incorporation fidelity in a nucleotide
3 polymerizing agent relative to a base incorporation fidelity of the agent in the absence of the
4 modified nucleotide.
- 1 2.(withdrawn) The composition of claim 1, wherein the modified nucleotide comprises
2 a β and/or γ phosphate modified nucleotide.
- 1 3.(withdrawn) The composition of claim 1, wherein the modified nucleotide comprises
2 a β phosphate modified nucleotide.
- 1 4.(withdrawn) The composition of claim 1, wherein the modified nucleotide comprises
2 a γ phosphate modified nucleotide.
- 1 5.(withdrawn) The composition of claim 4, wherein the tag comprises a molecule.
- 1 6.(withdrawn) The composition of claim 5, wherein the tag is ANS.
- 1 7.(currently amended) A method comprising the step of adding a modified nucleotide
2 including a molecular and/or atomic tag, where the nucleotide alters base incorporation
3 fidelity of a nucleotide polymerizing agent relative to a base incorporation fidelity of the
4 agent in the absence of the modified nucleotide, to a nucleotide polymerization medium
5 comprising a nucleotide polymerizing agent, where the modified nucleotide alters base
6 incorporation fidelity of a nucleotide polymerizing agent relative to a base incorporation
7 fidelity of the polymerizing agent in the absence of the modified nucleotide.

1 8.(original) The method of claim 7, wherein the modified nucleotide comprises a β and/or
2 γ phosphate modified nucleotide.

1 9.(original) The method of claim 7, wherein the modified nucleotide comprises a β
2 phosphate modified nucleotide.

1 10.(original) The method of claim 7, wherein the modified nucleotide comprises a γ
2 phosphate modified nucleotide.

1 11.(original) The method of claim 10, wherein the tag comprises a molecule.

1 12.(currently amended) The method of claim 11, wherein the tag is comprises
2 aminonaphthalene-1-sulfonate (ANS).

1 13.(currently amended) A method comprising the step of adding a modified nucleotide
2 including a molecular and/or atomic tag, ~~where the nucleotide alters base incorporation~~
3 ~~fidelity of a nucleotide polymerizing agent relative to a base incorporation fidelity of the~~
4 ~~agent in the absence of the modified nucleotide; to an assay for extending a nucleotide~~
5 ~~sequence, where the modified nucleotide alters base incorporation fidelity of a nucleotide~~
6 ~~polymerizing agent relative to a base incorporation fidelity of the polymerizing agent in the~~
7 ~~absence of the modified nucleotide, and the assay is selected from the group consisting of~~
8 genotyping for *in vitro* reproductive methods (human and other organisms); single nucleotide
9 polymorphism (SNP) detection; DNA sequencing; RNA sequencing; single nucleotide
10 extension assays; amplified DNA product assays; rolling circle product assays; PCR product
11 assays; allele-specific primer extension assays; single-molecule arrays (DNA, RNA, protein)
12 assays; and drug toxicity evaluation assays.

1 14.(withdrawn) A method for making blunt-ended fragments comprising the steps of
2 amplifying a DNA fragment in the presence of a nucleotide including a molecular and/or
3 atomic tag on a γ phosphate group and/or a base moiety, where the tag alters fidelity of base
4 incorporation and decreases or eliminates non-templated addition of a base to the 3' end of
5 the DNA fragment being amplified.

1 15. A kit for performing a nucleotide polymerizing reaction comprising polymerizing
2 reagents and at least one modified nucleotide including an atomic and/or molecular tag,
3 where the modified nucleotide alters extension fidelity.

1 16.(withdrawn) A method of inhibiting or preventing pyrophosphorolysis during
2 synthesis of a nucleic acid molecule, said method comprising

3 (a) combining a primer with a nucleic acid template under conditions sufficient to form a
4 hybridized product; and
5 (b) incubating the hybridized product with a polymerase in the presence or absence of an
6 enzyme selected from the group consisting of a pentosyltransferase, a phosphotransferase
7 with alcohol group as acceptor, a nucleotidyltransferase, and a carboxy-lyase, under
8 conditions sufficient to form a second nucleic acid molecule complementary to all or a
9 portion of the nucleic acid template,

10 where a tagged nucleotide comprises an atomic and/or molecular tag or moiety
11 attached to and/or associated with a β and/or γ -phosphate and/or a base moiety of the
12 nucleotide is added at either or both steps to inhibit or prevent pyrophosphorolysis during
13 synthesis of a nucleic acid molecule.

1 17.(withdrawn) A composition comprising a nucleotide including a molecular and/or
2 atomic tag on a phosphate group adapted to alter the fidelity of viral replication.

1 18.(withdrawn) The composition of claim 17, wherein the virus is HIV.

1 19.(withdrawn) A method for increasing the fidelity of replication comprising
2 administering an therapeutically effective amount of a nucleotide including a molecular
3 and/or atomic tag on a γ phosphate group to an animal including a human, where the
4 nucleotide is designed to increase base incorporation fidelity during replication.

1 20.(withdrawn) The method of claim 19, wherein the replication is caused by an HIV
2 virus.

1 21.(new) The method of claim 7, wherein the tag comprises a molecule covalently
2 bonded to the modified nucleotide through a linker.

1 22.(new) The method of claim 7, wherein the tag comprises a molecule covalently
2 bonded to the modified nucleotide.

1 23.(new) The method of claim 11, wherein the molecule comprises a fluorophore
2 selected from the group consisting of 4-acetamido-4'-isothiocyanatostilbene-2,2'disulfonic
3 acid; acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl)
4 aminonaphthalene-1-sulfonic acid (EDANS); 4-amino - 3-vinylsulfonyl) phenyl] naphthalimide-3,5 disulfonate;-(4-anilino-1naphthyl) maleimide; anthranilamide; BODIPY;
6 Brilliant Yellow; coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC,
7 Coumarin 120), 7-amino-4trifluoromethylcouluarin (Coumaran 151); cyanine dyes;
8 cyanosine; 4', 6-diaminidino-2phenylindole (DAPI); 5', 5"-dibromopyrogallol-
9 sulfonaphthalein (Bromopyrogallol Red); 7-diethylamino-3- (4'-isothiocyanatophenyl)-4-
10 methylcoumarin; diethylenetriamine pentaacetate; 4,4'-diisothiocyanatodihydro-stilbene-2,2'-
11 disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic acid; 5-dimethylamino
12 naphthalene-1-sulfonyl chloride(DNS, dansylchloride); 4-dimethylaminophenylazophenyl-
13 4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin isothiocyanate, erythrosin

14 and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium; fluorescein and
15 derivatives: 5carboxyfluorescein (FAM), 5- (4, 6-dichlorotriazin-2-yl) aminofluorescein
16 (DTAF), 2',7'dimethoxy-4'5'-dichloro-6-carboxyfluorescein (JOE), fluorescein, fluorescein
17 isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green
18 isothiocyanate; 4-methylumbelliferoneortho cresolphthalein; nitrotyrosine; pararosaniline;
19 Phenol Red; B-phycoerythrin; o-phthaldialdehyde; pyrene and derivatives: pyrene, pyrene
20 butyrate, succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (CibacronTM
21 Brilliant Red 3B-A) rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX),
22 6carboxyrhodamine (R6G), lissamine rhodamine B sulfonyl chloride rhodamine (Rhod),
23 rhodamine B, rhodamine 123, rhodamine X isothiocyanate, sulforhodamine B,
24 sulforhodamine 101, sulfonyl chloride derivative of sulforhodamine 101 (Texas Red); N,N,
25 N', N'-tetramethyl-6-carboxyrhodamine (TAMRA); tetramethyl rhodamine; tetramethyl
26 rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid; terbium chelate derivatives; Cy
27 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalo cyanine; and naphthalo
28 cyanine.

1 24.(new) The method of claim 11, wherein the molecule is selected from the group
2 consisting of alkyl groups having between 1 and 30 carbon atoms, aryl groups having
3 between about 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between
4 about 7 and about 40 carbon atoms, or mixture or combinations thereof, where the carbon
5 atoms are replaced by one or more hetero atoms in the structure provided the structure
6 represents a stable molecular system, where the hetero atoms selected from the group
7 consisting of P, S, Si, N, and O.

1 25.(new) The method of claim 11, wherein the molecule is selected from the group
2 consisting of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-
3 methylphenol, 6-chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-
4 iodonaphthol, 4-bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline,

5 4-nitronaphthol, 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol,
6 resorufin, 4-methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-
7 bromonaphthol, 6-nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-
8 methylnaphthol, fluorescein, 6-methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-
9 propyne, 1-hydroxy-4-pentyne, 1-hydroxy-3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol,
10 Propanol, Isopropanol, Butanol, Tert-butanol, Hexanol, Cyclohexanol, Heptanol, Octanol,
11 Decanol, Undecanol, Dodecanol, 1-acetoxymethanol (CH₃COCH₂-O-NTP), 2-
12 acetoxymethanol, 3-acetoxymethanol, 4-acetoxymethanol, 5-acetoxypentanol, 6-acetoxymethanol,
13 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol, 1-hydroxy-3-
14 propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde, 1-
15 hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-
16 Butanone, Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-
17 hydroxypyridine, 4-Acetoxymethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-
18 acetoxymethyl-3-hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-
19 methoxyphenol 6-methoxy-8-hydroxyquinoline, 4-ethylphenol, 4-methyl-8-
20 hydroxyquinoline, 4-butylphenol, 6-nitro-8-hydroxyquinoline, naphthol, 4-acetoxymethyl-8-
21 hydroxyquinoline, 4 or 6 or 8 methylnaphthol pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-
22 8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-8-hydroxypyrene, 4 or 6 or 8
23 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-
24 (carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxymethylnaphthol, 6-carboxymethyl-
25 2,7-dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-
26 carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol,
27 2-nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

1 26.(new) The method of claim 10, wherein the modified nucleotide is selected from the
2 group consisting of Adenosine-5'- (γ -ANS) triphosphate, Guanosine-5'- (γ -ANS)
3 triphosphate, Cytosine-5'- (γ -ANS) triphosphate, Thymidine-5'- (γ -ANS) triphosphate,
4 Adenosine-5'- (γ -4-nitrophenyl) triphosphate, Adenosine-5'- (γ -4-iodonaphthyl), Guanosine-

5 5'- (γ-4-nitrophenyl) triphosphate, triphosphate Adenosine-5'- (γ-6-methylnaphthyl)
6 triphosphate, Cytosine-5'- (γ-4-nitrophenyl) triphosphate, Thymidine-5'- (γ-4-nitrophenyl)
7 triphosphate, Adenosine-5'- (γ-6-methoxynaphthyl) triphosphate, Uracil-5'- (γ-4-nitrophenyl)
8 triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ-4-nitrophenyl)triphosphate, Adenosine-5'- (γ-
9 6-aminonaphthyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'-(γ-4-
10 nitrophenyl)triphosphate, Adenosine-5'- (γ-6-nitronaphthyl) triphosphate, 2',3'-didehydro-2',
11 3'-dideoxythymidine-5'-(γ-4-nitrophenyl)triphosphate, Adenosine-5'- (γ-6-chloronaphthyl)
12 triphosphate, Adenosine-5'- (γ-4-aminophenyl) triphosphate, Adenosine-5'- (γ-6-
13 bromonaphthyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl) triphosphate, Adenosine-5'-
14 (γ-6-iodonaphthyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl) triphosphate,
15 Adenosine-5'-(γ-4'-hydroxybiphenyl) triphosphate, Adenosine-5'- (γ-4-chlorophenyl)
16 triphosphate, Adenosine-5'- (γ-8-quinolyl) triphosphate, Adenosine-5'- (γ-4-bromophenyl)
17 triphosphate, Adenosine-5'- (γ-3-pyridyl) triphosphate, Adenosine-5'- (γ-umbelliferone),
18 Adenosine-5'- (γ-4-iodophenyl) triphosphate, Adenosine-5'- (γ-4-nitronaphthyl)
19 triphosphate, Adenosine-5'- (γ-resorufin) triphosphate, Adenosine-5'- (γ-pyrene)
20 triphosphate, Adenosine-5'- (γ-4-aminonaphthyl) triphosphate, Adenosine-5'- (γ-anthracene)
21 triphosphate, Adenosine-5'-(Γ-6-nitroanthracene) triphosphate, Adenosine-5'- (γ-4-
22 methylnaphthyl) triphosphate, Adenosine-5'- (γ-flavonyl) triphosphate, Adenosine-5'-(γ-4-
23 methoxynaphthyl) triphosphate, Adenosine-5'-(γ-fluorescein) triphosphate, Adenosine-5'-
24 (γ-benzoflavone) triphosphate, Adenosine-5'- (γ-4-chloronaphthyl) triphosphate, Adenosine-
25 5'- (γ- (4-nitrophenyl)- γ'- (4-aminophenyl) triphosphate, Adenosine-5'- (γ-4-
26 bromonaphthyl) triphosphate, Adenosine-5'- (γ- (4-nitrophenyl)- γ'- (4-nitronaphthyl)
27 triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
28 acetoxypropyl)triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Cytosine-5'- (γ-methyl)
29 triphosphate, Adenosine-5'- (γ-acetoxymethyl)triphosphate (CH₃OCCH₂-O-NTP),
30 Thymidine-5'- (γ-methyl) triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
31 acetoxymethyl) triphosphate, 3'-azido-3'-deoxythymidine-5-(γ-methyl)triphosphate,
32 Adenosine-5'- (γ-acetoxybutyl)triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'-(γ-methyl)

33 triphosphate, Adenosine-5'- (γ , acetoxypentyl) triphosphate, 2', 3'-didehydro-2', 3'-
34 dideoxythymidine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -acetoxyhexyl) triphosphate,
35 Adenosine-5'- (γ -ethyl) triphosphate, Adenosine-5'- (γ -2-nitroethyl) triphosphate,
36 Adenosine-5'- (γ -propyl) triphosphate, Adenosine-5'- (γ -4-butyl) triphosphate, Adenosine-5'-
37 (γ -3-nitropropyl) triphosphate, Adenosine-5'- (γ -hexyl) triphosphate, Adenosine-5'- (γ -octyl)
38 triphosphate, Adenosine-5'- (γ -4-nitrobutyl) triphosphate, Adenosine-5'- (γ -decyl)
39 triphosphate, Adenosine-5'- (γ -dodecyl) triphosphate, Adenosine-5'- (γ -5-
40 nitropentyl) triphosphate, Adenosine-5'- (γ -isopropyl) triphosphate, Adenosine-5'- (γ -tert-
41 butyl) triphosphate, Adenosine-5'- (γ -methyl)- (γ' -ethyl) triphosphate, Adenosine-5'- (γ -
42 cyclohexyl) triphosphate, Adenosine-5'- (γ -methyl)- (γ' -propyl) triphosphate, Adenosine-5'-
43 (γ -2-propenyl) triphosphate, Adenosine-5'- (γ -3-but enyl) triphosphate, Guanosine-5'- (γ -2-
44 propenyl) triphosphate, Adenosine-5'- (γ -4-pentenyl) triphosphate, Cytosine-5'- (γ -2-
45 propenyl) triphosphate, Adenosine-5'- (γ -5-hexenyl) triphosphate, Thymidine-5'- (γ -2-
46 propenyl) triphosphate, Adenosine-5'- (γ -cyclohexenyl) triphosphate, Uracil-5'- (7-2-
47 propenyl) triphosphate, Adenosine-5'- (γ -3-propanaldehyde) triphosphate, 3'-azido-3'-
48 deoxythymidine-5'- (γ -2-propenyl) triphosphate, Adenosine-5'- (γ -4-butanaldehyde)
49 triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ -2-propenyl) triphosphate, Adenosine-5'-
50 (γ -3-butanone) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ -2-propenyl)
51 triphosphate, Adenosine-5'- (γ -2-propynyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-
52 (γ -2-propynyl) triphosphate, Guanosine-5'- (γ -2-propynyl) triphosphate, Cytosine-5'- (γ -2-
53 propynyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ -2-propynyl)
54 triphosphate Thymidine 5'- (γ -2-propynyl) triphosphate, Uracil-5'- (γ -2-propynyl)
55 triphosphate, Adenosine-5'- (γ -3-butynyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ -2-
56 propynyl) triphosphate, Adenosine-5'- (γ -4-pentynyl) triphosphate, Adenosine-5'- (γ -5-
57 pentynyl) triphosphate, Adenosine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (4 or 6
58 or 8 acetoxy methyl naphthyl) triphosphate, Guanosine-5'- (γ -4-phenyl) triphosphate,
59 Cytosine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (4-methylpyridyl) triphosphate,
60 Thymidine-5'- (γ -4-phenyl) triphosphate, Uracil-5'- (γ -4-phenyl) triphosphate, Adenosine-5'-

61 (γ- (5-methoxypyridyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-4-phenyl)
62 triphosphate, Adenosine-5'- (γ- (5-nitropyridyl)triphosphate, 3'-azido-2',3'-dideoxythymidine-
63 5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-acetoxymethylpyridyl) triphosphate, 2',
64 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (6-
65 methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-carboxyphenyl) triphosphate,
66 Adenosine-5'-(γ-(6-methoxy-1-quinolyl)triphosphate, Adenosine-5'- (γ- (4-acetoxymethyl)
67 phenyl) triphosphate, Adenosine-5'- (γ- (4-methyl-1-quinolyl)triphosphate, Adenosine-5'-
68 (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl)triphosphate, Adenosine-5'-
69 (γ- (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl) triphosphate,
70 Adenosine-5'- (γ- (4-acetoxymethylpyrenyl) triphosphate, Adenosine-5'- (γ-4-ethylphenyl)
71 triphosphate, Adenosine-5'- (γ- (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
72 butylphenyl) triphosphate, Adenosine 5'-(γ-naphthyl) triphosphate, Adenosine-5'- (γ- (6-
73 ethylpyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methyl naphthyl)triphosphate,
74 Adenosine-5'- (γ- (6-nitropyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8
75 methoxynaphthyl) triphosphate, Adenosine-5'- (γ-6- (carboxysuccinimidyl fluorescein)
76 triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 nitro naphthyl) triphosphate. Adenosine-5'- (γ-6-
77 carboxymethyl-2, 7-dichlorofluorescein) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 ethyl
78 naphthyl) triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4 nitrophenyl) triphosphate,
79 Adenosine-5'- (γ- (4 or 6 or 8 butyl naphthyl)triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4
80 aminophenyl)triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-
81 aminopropyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-4-
82 aminobutyl) triphosphate, Cytosine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-cyclohexyl)
83 triphosphate, Thymidine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-2-carboxyethyl)
84 triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-
85 carboxypropyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (7-methyl) triphosphate,
86 Adenosine-5'- (γ-4-carboxybutyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-
87 methyl) triphosphate, Adenosine-5'- (γ-2-hydroxyethyl) triphosphate, 2',3'-didehydro-2',3'-
88 dideoxythymidine-5'-(γ-methyl)triphosphate, Adenosine-5'- (γ-3-hydroxypropyl)

89 triphosphate, Adenosine-5'- (γ -ethyl) triphosphate, Adenosine-5'- (γ -propyl) triphosphate,
90 Adenosine-5'- (γ -4-hydroxybutyl) triphosphate, Adenosine-5'- (γ -4-butyl) triphosphate,
91 Adenosine-5'- (γ -2-nitroethyl) triphosphate, Adenosine-5'- (γ -hexyl) triphosphate,
92 Adenosine-5'- (γ -3-nitropropyl) triphosphate, Adenosine-5'- (γ -isopropyl) triphosphate,
93 Adenosine-5'- (γ -4-nitrobutyl) triphosphate, Adenosine-5'- (γ -tert-butyl) triphosphate
94 ,Adenosine-5'- (γ -methyl)- (γ' -ethyl)triposphate, Adenosine-5'- (γ -cyclohexyl) triphosphate,
95 Adenosine-5'- (γ -2-aminoethyl)triposphate, and Adenosine-5'- (γ -methyl)- (γ' -propyl)
96 triphosphate.

1 27.(new) The method of claim 13, wherein the tag comprises a molecule covalently
2 bonded to the modified nucleotide through a linker.

1 28.(new) The method of claim 13, wherein the tag comprises a molecule covalently
2 bonded to the modified nucleotide.

1 29.(new) The method of claim 13, wherein the modified nucleotide comprises a β and/or
2 γ phosphate modified nucleotide.

1 30.(new) The method of claim 13, wherein the modified nucleotide comprises a β
2 phosphate modified nucleotide.

1 31.(new) The method of claim 13, wherein the modified nucleotide comprises a γ
2 phosphate modified nucleotide.

1 32.(new) The method of claim 28, wherein the molecule comprises a fluorophore
2 selected from the group consisting of 4-acetamido-4'isothiocyanatostilbene-2,2'disulfonic
3 acid; acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl)
4 aminonaphthalene-1-sulfonic acid (EDANS); 4-amino - 3-vinylsulfonyl) phenyl]

5 naphthalimide-3,5 disulfonate; -(4-anilino-1naphthyl) maleimide; anthranilamide; BODIPY;
6 Brilliant Yellow; coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC,
7 Coumarin 120), 7-amino-4trifluoromethylcouluarin (Coumaran 151); cyanine dyes;
8 cyanosine; 4', 6-diaminidino-2phenylindole (DAPI); 5', 5"-dibromopyrogallol-
9 sulfonaphthalein (Bromopyrogallol Red); 7-diethylamino-3- (4'-isothiocyanatophenyl)-4-
10 methylcoumarin; diethylenetriamine pentaacetate; 4,4'-diisothiocyanatodihydro-stilbene-2,2'-
11 disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic acid; 5-dimethylamino
12 naphthalene-1-sulfonyl chloride (DNS, dansylchloride); 4-dimethylaminophenylazophenyl-
13 4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin isothiocyanate, erythrosin
14 and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium; fluorescein and
15 derivatives: 5carboxyfluorescein (FAM), 5- (4, 6-dichlorotriazin-2-yl) aminofluorescein
16 (DTAF), 2', 7'dimethoxy-4'5'-dichloro-6-carboxyfluorescein (JOE), fluorescein, fluorescein
17 isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green
18 isothiocyanate; 4-methylumbelliferoneortho cresolphthalein; nitrotyrosine; pararosaniline;
19 Phenol Red; B-phycoerythrin; o-phthaldialdehyde; pyrene and derivatives: pyrene, pyrene
20 butyrate, succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (CibacronTM
21 Brilliant Red 3B-A) rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX),
22 6carboxyrhodamine (R6G), lissamine rhodamine B sulfonyl chloride rhodamine (Rhod),
23 rhodamine B, rhodamine 123, rhodamine X isothiocyanate, sulforhodamine B,
24 sulforhodamine 101, sulfonyl chloride derivative of sulforhodamine 101 (Texas Red); N,N,
25 N', N'-tetramethyl-6-carboxyrhodamine (TAMRA); tetramethyl rhodamine; tetramethyl
26 rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid; terbium chelate derivatives; Cy
27 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalo cyanine; and naphthalo
28 cyanine.

1 33.(new) The method of claim 28, wherein the molecule is selected from the group
2 consisting of alkyl groups having between 1 and 30 carbon atoms, aryl groups having
3 between about 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between

4 about 7 and about 40 carbon atoms, or mixture or combinations thereof, where the carbon
5 atoms are replace by one or more hetero atoms in the structure provided the structure
6 represents a stable molecular system, where the hetero atoms selected from the group
7 consisting of P, S, Si, N, and O.

1 34.(new) The method of claim 28, wherein the molecule is selected from the group
2 consisting of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-
3 methylphenol, 6-chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-
4 iodonaphthol, 4-bromophenol, 4,4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline,
5 4-nitronaphthol, 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol,
6 resorufin, 4-methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-
7 bromonaphthol, 6-nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-
8 methylnaphthol, fluorescein, 6-methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-
9 propyne, 1-hydroxy-4-pentyne, 1-hydroxy-3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol,
10 Propanol, Isopropanol, Butanol, Tert-butanol, Hexanol, Cyclohexanol, Heptanol, Octanol,
11 Decanol, Undecanol, Dodecanol, 1-acetoxymethanol (CH₃COCH₂-O-NTP), 2-
12 acetoxyethanol, 3-acetoxypropanol, 4-acetoxybutanol, 5-acetoxypentanol, 6-acetoxyhexanol,
13 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol, 1-hydroxy-3-
14 propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde, 1-
15 hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-
16 Butanone, Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-
17 hydroxypyridine, 4-Acetoxyethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-
18 acetoxymethyl-3-hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-
19 methoxyphenol 6-methoxy-8-hydroxyquinoline, 4-ethylphenol, 4-methyl-8-
20 hydroxyquinoline, 4-butylphenol, 6-nitro-8-hydroxyquinoline, naphthol, 4-acetoxymethyl-8-
21 hydroxyquinoline, 4 or 6 or 8 methylnaphthol pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-
22 8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-8-hydroxypyrene, 4 or 6 or 8
23 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-

24 (carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxymethylnaphthal, 6-carboxymethyl-
25 2,7-dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-
26 carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol,
27 2-nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

1 35.(new) The method of claim 31, wherein the modified nucleotide is selected from the
2 group consisting of Adenosine-5'- (γ -ANS) triphosphate, Guanosine-5'- (γ -ANS)
3 triphosphate, Cytosine-5'- (γ -ANS) triphosphate, Thymidine-5'- (γ -ANS) triphosphate,
4 Adenosine-5'-(γ -4-nitrophenyl) triphosphate, Adenosine-5'-(γ -4-iodonaphthyl), Guanosine-
5 5'- (γ -4-nitrophenyl) triphosphate, triphosphate Adenosine-5'- (γ -6-methylnaphthyl)
6 triphosphate, Cytosine-5'- (γ -4-nitrophenyl) triphosphate, Thymidine-5'- (γ -4-nitrophenyl)
7 triphosphate, Adenosine-5'- (γ -6-methoxynaphthyl) triphosphate, Uracil-5'- (γ -4-nitrophenyl)
8 triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -4-nitrophenyl)triphosphate, Adenosine-5'- (γ -
9 6-aminonaphthyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ -4-
10 nitrophenyl)triphosphate, Adenosine-5'- (γ -6-nitronaphthyl) triphosphate, 2', 3'-didehydro-2',
11 3'-dideoxythymidine-5'- (γ -4-nitrophenyl)triphosphate, Adenosine-5'- (γ -6-chloronaphthyl)
12 triphosphate, Adenosine-5'- (γ -4-aminophenyl) triphosphate, Adenosine-5'- (γ -6-
13 bromonaphthyl) triphosphate, Adenosine-5'- (γ -4-methylphenyl) triphosphate, Adenosine-5'-
14 (γ -6-iodonaphthyl) triphosphate, Adenosine-5'- (γ -4-methoxyphenyl) triphosphate,
15 Adenosine-5'- (γ -4'-hydroxybiphenyl) triphosphate, Adenosine-5'- (γ -4-chlorophenyl)
16 triphosphate, Adenosine-5'- (γ -8-quinolyl) triphosphate, Adenosine-5'- (γ -4-bromophenyl)
17 triphosphate, Adenosine-5'- (γ -3-pyridyl) triphosphate, Adenosine-5'- (γ -umbelliferone),
18 Adenosine-5'- (γ -4-iodophenyl) triphosphate, Adenosine-5'- (γ -4-nitronaphthyl)
19 triphosphate, Adenosine-5'- (γ -resorufin) triphosphate, Adenosine-5'- (γ -pyrene)
20 triphosphate, Adenosine-5'- (γ -4-aminonaphthyl) triphosphate, Adenosine-5'- (γ -anthracene)
21 triphosphate, Adenosine-5'- (Γ -6-nitroanthracene) triphosphate, Adenosine-5'- (γ -4-
22 methylnaphthyl) triphosphate, Adenosine-5'- (γ -flavonyl) triphosphate, Adenosine-5'- (γ -4-
23 methoxynaphthyl) triphosphate, Adenosine-5'- (γ -fluorescein) triphosphate, Adenosine-5'-

24 (γ-benzoflavone) triphosphate, Adenosine-5'-(γ-4-chloronaphthyl) triphosphate, Adenosine-
25 5'- (γ- (4-nitrophenyl)- γ'- (4-aminophenyl) triphosphate, Adenosine-5'- (γ-4-
26 bromonaphthyl) triphosphate, Adenosine-5'- (γ- (4-nitrophenyl)- γ'- (4-nitronaphthyl)
27 triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
28 acetoxypropyl)triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Cytosine-5'- (γ-methyl)
29 triphosphate, Adenosine-5'- (γ-acetoxymethyl)triphosphate (CH₃OCCCH₂-O-NTP),
30 Thymidine-5'- (γ-methyl) triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
31 acetoxymethyl) triphosphate, 3'-azido-3'-deoxythymidine-5-(γ-methyl)triphosphate,
32 Adenosine-5'- (γ-acetoxybutyl)triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ-methyl)
33 triphosphate, Adenosine-5'- (γ, acetoxypentyl) triphosphate, 2', 3'-didehydro-2', 3'-
34 dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-acetoxyhexyl) triphosphate,
35 Adenosine-5'- (γ-ethyl) triphosphate, Adenosine-5'- (γ-2-nitroethyl) triphosphate,
36 Adenosine-5'- (γ-propyl) triphosphate, Adenosine-5'- (γ-4-butyl) triphosphate, Adenosine-5'-
37 (γ-3-nitropropyl) triphosphate, Adenosine-5'- (γ-hexyl) triphosphate, Adenosine-5'- (γ-octyl)
38 triphosphate, Adenosine-5'- (γ-4-nitrobutyl)triphosphate, Adenosine-5'- (γ-decyl)
39 triphosphate, Adenosine-5'- (γ-dodecyl) triphosphate, Adenosine-5'- (γ-5-
40 nitropentyl)triphosphate, Adenosine-5'- (γ-isopropyl) triphosphate, Adenosine-5'- (γ-tert-
41 butyl) triphosphate, Adenosine-5'- (γ-methyl)- (γ'-ethyl) triphosphate, Adenosine-5'- (γ-
42 cyclohexyl) triphosphate, Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate, Adenosine-5'-
43 (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-3-butenyl) triphosphate, Guanosine-5'- (γ-2-
44 propenyl) triphosphate, Adenosine-5'- (γ-4-pentenyl) triphosphate, Cytosine-5'- (γ-2-
45 propenyl) triphosphate, Adenosine-5'- (γ-5-hexenyl) triphosphate, Thymidine-5'- (γ-2-
46 propenyl) triphosphate, Adenosine-5'- (γ-cyclohexenyl) triphosphate, Uracil-5'- (7-2-
47 propenyl) triphosphate, Adenosine-5'- (γ-3-propanaldehyde) triphosphate, 3'-azido-3'-
48 dideoxythymidine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-4-butanaldehyde)
49 triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ-2- propenyl) triphosphate, Adenosine-5'-
50 (γ-3-butanone) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-2-propenyl)
51 triphosphate, Adenosine-5'- (γ-2-propynyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'-

52 (γ-2-propynyl) triphosphate, Guanosine-5'- (γ-2-propynyl) triphosphate, Cytosine-5'- (γ-2-
53 propynyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-2-propynyl)
54 triphosphate Thymidine 5'- (γ-2-propynyl) triphosphate, Uracil-5'- (γ-2-propynyl)
55 triphosphate, Adenosine-5'- (γ-3-butynyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-
56 propynyl) triphosphate, Adenosine-5'- (γ-4-pentynyl) triphosphate, Adenosine-5'- (γ-5-
57 pentynyl) triphosphate, Adenosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4 or 6
58 or 8 acetoxymethyl naphthyl) triphosphate, Guanosine-5'- (γ-4-phenyl) triphosphate,
59 Cytosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4-methylpyridyl)triphosphate,
60 Thymidine-5'- (γ-4-phenyl) triphosphate, Uracil-5'- (γ-4-phenyl) triphosphate, Adenosine-5'-
61 (γ- (5-methoxypyridyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-4-phenyl)
62 triphosphate, Adenosine-5'- (γ- (5-nitropyridyl)triphosphate, 3'-azido-2',3'-dideoxythymidine-
63 5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-acetoxymethylpyridyl) triphosphate, 2',
64 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (6-
65 methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-carboxyphenyl) triphosphate,
66 Adenosine-5'- (γ- (6-methoxy-1-quinolyl)triphosphate, Adenosine-5'- (γ- (4-acetoxymethyl)
67 phenyl) triphosphate, Adenosine-5'- (γ- (4-methyl-1-quinolyl)triphosphate, Adenosine-5'- (γ-4-nitrophenyl)
68 triphosphate, Adenosine-5'- (γ-4-methylphenyl)triphosphate, Adenosine-5'-
69 (γ- (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl) triphosphate,
70 Adenosine-5'- (γ- (4-acetoxymethylpyrenyl) triphosphate, Adenosine-5'- (γ-4-ethylphenyl)
71 triphosphate, Adenosine-5'- (γ- (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
72 butylphenyl) triphosphate, Adenosine 5'- (γ-naphthyl) triphosphate, Adenosine-5'- (γ- (6-
73 ethylpyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methyl naphthyl)triphosphate,
74 Adenosine-5'- (γ- (6-nitropyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8
75 methoxynaphthyl) triphosphate, Adenosine-5'- (γ-6- (carboxysuccinimidyl fluorescein)
76 triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 nitro naphthyl) triphosphate. Adenosine-5'- (γ-6-
77 carboxymethyl-2, 7-dichlorofluorescein) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 ethyl
78 naphthyl) triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4 nitrophenyl) triphosphate,
79 Adenosine-5'- (γ- (4 or 6 or 8 butyl naphthyl)triphosphate, Adenosine-5'- (γ-4-phenyl)- (γ'-4

80 aminophenyl)triphosphate, Adenosine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -3-
81 aminopropyl) triphosphate, Guanosine-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -4-
82 aminobutyl) triphosphate, Cytosine-5'- (γ -methyl) triphosphate Adenosine-5'- (γ -cyclohexyl)
83 triphosphate, Thymidine-5'- (γ -methyl) triphosphate Adenosine-5'- (γ -2-carboxyethyl)
84 triphosphate, Uracil-5'- (γ -methyl) triphosphate, Adenosine-5'- (γ -3-
85 carboxypropyl)triphosphate, 3'-azido-3'-deoxythymidine-5'- (7-methyl) triphosphate,
86 Adenosine-5'- (γ -4-carboxybutyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ -
87 methyl) triphosphate, Adenosine-5'- (γ -2-hydroxyethyl) triphosphate, 2',3'-didehydro-2',3'-
88 dideoxythymidine-5'-(γ -methyl)triphosphate, Adenosine-5'- (γ -3-hydroxypropyl)
89 triphosphate, Adenosine-5'- (γ -ethyl) triphosphate, Adenosine-5'- (γ -propyl) triphosphate,
90 Adenosine-5'- (γ -4-hydroxybutyl) triphosphate, Adenosine-5'- (γ -4-butyl) triphosphate,
91 Adenosine-5'- (γ -2-nitroethyl) triphosphate, Adenosine-5'- (γ -hexyl) triphosphate,
92 Adenosine-5'- (γ -3-nitropropyl) triphosphate, Adenosine-5'- (γ -isopropyl) triphosphate,
93 Adenosine-5'- (γ -4-nitrobutyl) triphosphate, Adenosine-5'- (γ -tert-butyl) triphosphate
94 ,Adenosine-5'- (γ -methyl)- (γ' -ethyl)triphosphate, Adenosine-5'- (γ -cyclohexyl) triphosphate,
95 Adenosine-5'- (γ -2-aminoethyl)triphosphate, and Adenosine-5'- (γ -methyl)- (γ' -propyl)
96 triphosphate.

1 **36.(new)** The method of claim 7, wherein the polymerizing agent is selected from the
2 group consisting of naturally occurring or synthetic polymerases and reverse transcriptases.

1 **37.(new)** The method of claim 13, wherein the polymerizing agent is selected from the
2 group consisting of naturally occurring or synthetic polymerases and reverse transcriptases.

1 **38.(new)** The kit of claim 15, wherein the tag comprises a molecule covalently bonded
2 to the modified nucleotide through a linker.

1 **39.(new)** The kit of claim 15, wherein the tag comprises a molecule covalently bonded
2 to the modified nucleotide.

1 **40.(new)** The kit of claim 15, wherein the modified nucleotide comprises a β and/or γ
2 phosphate modified nucleotide.

1 **41.(new)** The kit of claim 15, wherein the modified nucleotide comprises a β phosphate
2 modified nucleotide.

1 **42.(new)** The kit of claim 15, wherein the modified nucleotide comprises a γ phosphate
2 modified nucleotide.

1 **43.(new)** The kit of claim 39, wherein the molecule comprises a fluorophore selected
2 from the group consisting of 4-acetamido-4'isothiocyanatostilbene-2,2'disulfonic acid;
3 acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl)
4 aminonaphthalene-1-sulfonic acid (EDANS); 4-amino – 3-vinylsulfonyl) phenyl] naphthalimide-3,5 disulfonate;-(4-anilino-1naphthyl) maleimide; anthranilamide; BODIPY;
6 Brilliant Yellow; coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC,
7 Coumarin 120), 7-amino-4trifluoromethylcouluarin (Coumaran 151); cyanine dyes;
8 cyanosine; 4', 6-diaminidino-2phenylindole (DAPI); 5', 5"-dibromopyrogallol-
9 sulfonaphthalein (Bromopyrogallol Red); 7-diethylamino-3- (4'-isothiocyanatophenyl)-4-
10 methylcoumarin; diethylenetriamine pentaacetate; 4,4'-diisothiocyanatodihydro-stilbene-2,2'-
11 disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic acid; 5-dimethylamino
12 naphthalene-1-sulfonyl chloride (DNS, dansylchloride); 4-dimethylaminophenylazophenyl-
13 4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin isothiocyanate, erythrosin
14 and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium; fluorescein and
15 derivatives: 5carboxyfluorescein (FAM), 5- (4, 6 -dichlorotriazin-2-yl) aminofluorescein
16 (DTAF), 2',7'dimethoxy-4'5'-dichloro-6-carboxyfluorescein (JOE), fluorescein, fluorescein

17 isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green
18 isothiocyanate; 4-methylumbelliferoneortho cresolphthalein; nitrotyrosine; pararosaniline;
19 Phenol Red; B-phycoerythrin; o-phthaldialdehyde; pyrene and derivatives: pyrene, pyrene
20 butyrate, succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (CibacronTM
21 Brilliant Red 3B-A) rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX),
22 6carboxyrhodamine (R6G), lissamine rhodamine B sulfonyl chloride rhodamine (Rhod),
23 rhodamine B, rhodamine 123, rhodamine X isothiocyanate, sulforhodamine B,
24 sulforhodamine 101, sulfonyl chloride derivative of sulforhodamine 101 (Texas Red); N, N,
25 N', N'-tetramethyl-6-carboxyrhodamine (TAMRA); tetramethyl rhodamine; tetramethyl
26 rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid; terbium chelate derivatives; Cy
27 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalo cyanine; and naphthalo
28 cyanine.

1 **44.(new)** The kit of claim 39, wherein the molecule is selected from the group consisting
2 of alkyl groups having between 1 and 30 carbon atoms, aryl groups having between about
3 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between about 7 and about
4 40 carbon atoms, or mixture or combinations thereof, where the carbon atoms are replace by
5 one or more hetero atoms in the structure provided the structure represents a stable molecular
6 system, where the hetero atoms selected from the group consisting of P, S, Si, N, and O.

1 **45.(new)** The kit of claim 39, wherein the molecule is selected from the group consisting
2 of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-methylphenol, 6-
3 chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-iodonaphthol, 4-
4 bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline, 4-nitronaphthol,
5 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol, resorufin, 4-
6 methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-
7 bromonaphthol, 6-nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-
8 methylnaphthol, fluorescein, 6-methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-

9 propyne, 1-hydroxy-4-pentyne, 1-hydroxy-3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol,
10 Propanol, Isopropanol, Butanol, Tert-butanol, Hexanol, Cyclohexanol, Heptanol, Octanol,
11 Decanol, Undecanol, Dodecanol, 1-acetoxymethanol (CH₃0OCCH₂-O-NTP), 2-
12 acetoxyethanol, 3-acetoxypropanol, 4-acetoxybutanol, 5-acetoxypentanol, 6-acetoxyhexanol,
13 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol, 1-hydroxy-3-
14 propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde, 1-
15 hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-
16 Butanone, Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-
17 hydroxypyridine, 4-Acetoxymethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-
18 acetoxymethyl-3-hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-
19 methoxyphenol 6-methoxy-8-hydroxyquinoline, 4-ethylphenol, 4-methyl-8-
20 hydroxyquinoline, 4-butylphenol, 6-nitro-8-hydroxyquinoline, naphthol, 4-acetoxymethyl-8-
21 hydroxyquinoline, 4 or 6 or 8 methylnaphthol pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-
22 8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-8-hydroxypyrene, 4 or 6 or 8
23 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-
24 (carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxymethylnaphthol, 6-carboxymethyl-
25 2,7-dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-
26 carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol,
27 2-nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

1 46.(new) The kit of claim 42, wherein the modified nucleotide is selected from the group
2 consisting of Adenosine-5'- (γ -ANS) triphosphate, Guanosine-5'- (γ -ANS) triphosphate,
3 Cytosine-5'- (γ -ANS) triphosphate, Thymidine-5'- (γ -ANS) triphosphate, Adenosine-5'- (γ -
4 4-nitrophenyl) triphosphate, Adenosine-5'- (γ -4-iodonaphthyl), Guanosine-5'- (γ -4-
5 nitrophenyl) triphosphate, triphosphate Adenosine-5'- (γ -6-methylnaphthyl) triphosphate,
6 Cytosine-5'- (γ -4-nitrophenyl) triphosphate, Thymidine-5'- (γ -4-nitrophenyl) triphosphate,
7 Adenosine-5'- (γ -6-methoxynaphthyl) triphosphate, Uracil-5'- (γ -4-nitrophenyl) triphosphate,
8 3'-azido-3'-deoxythymidine-5'-(γ -4-nitrophenyl)triphosphate, Adenosine-5'- (γ -6-

9 aminonaphthyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'-(γ -4-nitrophenyl)triphosphate, Adenosine-5'-(γ -6-nitronaphthyl) triphosphate, 2',3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -4-nitrophenyl)triphosphate, Adenosine-5'-(γ -6-chloronaphthyl) triphosphate, Adenosine-5'-(γ -4-aminophenyl) triphosphate, Adenosine-5'-(γ -6-bromonaphthyl) triphosphate, Adenosine-5'-(γ -4-methylphenyl) triphosphate, Adenosine-5'-(γ -6-iodonaphthyl) triphosphate, Adenosine-5'-(γ -4-methoxyphenyl) triphosphate, Adenosine-5'-(γ -4'-hydroxybiphenyl) triphosphate, Adenosine-5'-(γ -4-chlorophenyl) triphosphate, Adenosine-5'-(γ -8-quinolyl) triphosphate, Adenosine-5'-(γ -4-bromophenyl) triphosphate, Adenosine-5'-(γ -3-pyridyl) triphosphate, Adenosine-5'-(γ -umbelliferone), Adenosine-5'-(γ -4-iodophenyl) triphosphate, Adenosine-5'-(γ -4-nitronaphthyl) triphosphate, Adenosine-5'-(γ -resorufin) triphosphate, Adenosine-5'-(γ -pyrene) triphosphate, Adenosine-5'-(γ -4-aminonaphthyl) triphosphate, Adenosine-5'-(γ -anthracene) triphosphate, Adenosine-5'-(Γ -6-nitroanthracene) triphosphate, Adenosine-5'-(γ -4-methylnaphthyl) triphosphate, Adenosine-5'-(γ -flavonyl) triphosphate, Adenosine-5'-(γ -4-methoxynaphthyl) triphosphate, Adenosine-5'-(γ -fluorescein) triphosphate, Adenosine-5'-(γ -benzoflavone) triphosphate, Adenosine-5'-(γ -4-chloronaphthyl) triphosphate, Adenosine-5'-(γ - (4-nitrophenyl)- γ' - (4-aminophenyl) triphosphate, Adenosine-5'-(γ -4-bromonaphthyl) triphosphate, Adenosine-5'-(γ - (4-nitrophenyl)- γ' - (4-nitronaphthyl) triphosphate, Adenosine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxypropyl)triphosphate, Guanosine-5'-(γ -methyl) triphosphate, Cytosine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxymethyl)triphosphate (CH₃OCCCH₂-O-NTP), Thymidine-5'-(γ -methyl) triphosphate, Uracil-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxyethyl) triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -methyl)triphosphate, Adenosine-5'-(γ -acetoxybutyl)triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ , acetoxypentyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxyhexyl) triphosphate, Adenosine-5'-(γ -ethyl) triphosphate, Adenosine-5'-(γ -2-nitroethyl) triphosphate, Adenosine-5'-(γ -propyl) triphosphate, Adenosine-5'-(γ -4-butyl) triphosphate, Adenosine-5'-

37 (γ -3-nitropropyl) triphosphate, Adenosine-5'-(γ -hexyl) triphosphate, Adenosine-5'-(γ -octyl)
38 triphosphate, Adenosine-5'- (γ -4-nitrobutyl) triphosphate, Adenosine-5'- (γ -decyl)
39 triphosphate, Adenosine-5'- (γ -dodecyl) triphosphate, Adenosine-5'- (γ -5-
40 nitropentyl) triphosphate, Adenosine-5'- (γ -isopropyl) triphosphate, Adenosine-5'- (γ -tert-
41 butyl) triphosphate, Adenosine-5'- (γ -methyl)- (γ' -ethyl) triphosphate, Adenosine-5'- (γ -
42 cyclohexyl) triphosphate, Adenosine-5'- (γ -methyl)- (γ' -propyl) triphosphate, Adenosine-5'-
43 (γ -2-propenyl) triphosphate, Adenosine-5'- (γ -3-but enyl) triphosphate, Guanosine-5'- (γ -2-
44 propenyl) triphosphate, Adenosine-5'- (γ -4-pentenyl) triphosphate, Cytosine-5'- (γ -2-
45 propenyl) triphosphate, Adenosine-5'- (γ -5-hexenyl) triphosphate, Thymidine-5'- (γ -2-
46 propenyl) triphosphate, Adenosine-5'- (γ -cyclohexenyl) triphosphate, Uracil-5'- (7-2-
47 propenyl) triphosphate, Adenosine-5'- (γ -3-propanaldehyde) triphosphate, 3'-azido-3'-
48 deoxythymidine-5'- (γ -2-propenyl) triphosphate, Adenosine-5'- (γ -4-butanaldehyde)
49 triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ -2-propenyl) triphosphate, Adenosine-5'-
50 (γ -3-butanone) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ -2-propenyl)
51 triphosphate, Adenosine-5'- (γ -2-propynyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'-
52 (γ -2-propynyl) triphosphate, Guanosine-5'- (γ -2-propynyl) triphosphate, Cytosine-5'- (γ -2-
53 propynyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ -2-propynyl)
54 triphosphate Thymidine 5'- (γ -2-propynyl) triphosphate, Uracil-5'- (γ -2-propynyl)
55 triphosphate, Adenosine-5'- (γ -3-butynyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ -2-
56 propynyl) triphosphate, Adenosine-5'- (γ -4-pentynyl) triphosphate, Adenosine-5'- (γ -5-
57 pentynyl) triphosphate, Adenosine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (4 or 6
58 or 8 acetoxy methyl naphthyl) triphosphate, Guanosine-5'- (γ -4-phenyl) triphosphate,
59 Cytosine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (4-methylpyridyl) triphosphate,
60 Thymidine-5'- (γ -4-phenyl) triphosphate, Uracil-5'- (γ -4-phenyl) triphosphate, Adenosine-5'-
61 (γ - (5-methoxypyridyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ -4-phenyl)
62 triphosphate, Adenosine-5'- (γ - (5-nitropyridyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-
63 5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (5-acetoxy methylpyridyl) triphosphate, 2',
64 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ -4-phenyl) triphosphate, Adenosine-5'- (γ - (6-

65 methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ -4-carboxyphenyl) triphosphate,
66 Adenosine-5'-(γ -(6-methoxy-1-quinolyl)triphosphate, Adenosine-5'-(γ -(4-acetoxymethyl)
67 phenyl) triphosphate, Adenosine-5'-(γ -(4-methyl-1-quinolyl)triphosphate, Adenosine-5'
68 (γ -4-nitrophenyl) triphosphate, Adenosine-5'-(γ -4-methylphenyl)triphosphate, Adenosine-5'
69 (γ -(6-nitro-1-quinolyl) triphosphate, Adenosine-5'-(γ -4-methoxyphenyl) triphosphate,
70 Adenosine-5'-(γ -(4-acetoxymethylpyrenyl) triphosphate, Adenosine-5'-(γ -4-ethylphenyl)
71 triphosphate, Adenosine-5'-(γ -(6-methylpyrenyl) triphosphate, Adenosine-5'-(γ -4-
72 butylphenyl) triphosphate, Adenosine 5'-(γ -naphthyl) triphosphate, Adenosine-5'-(γ - (6-
73 ethylpyrenyl) triphosphate, Adenosine-5'-(γ -(4 or 6 or 8 methyl naphthyl)triphosphate,
74 Adenosine-5'-(γ -(6-nitropyrenyl) triphosphate, Adenosine-5'-(γ -(4 or 6 or 8
75 methoxynaphthyl) triphosphate, Adenosine-5'-(γ -6- (carboxysuccinimidyl fluorescein)
76 triphosphate, Adenosine-5'-(γ -(4 or 6 or 8 nitro naphthyl) triphosphate. Adenosine-5'-(γ -6-
77 carboxymethyl-2, 7-dichlorofluorescein) triphosphate, Adenosine-5'-(γ -(4 or 6 or 8 ethyl
78 naphthyl) triphosphate, Adenosine-5'-(γ -4-phenyl)- (γ' -4 nitrophenyl) triphosphate,
79 Adenosine-5'-(γ -(4 or 6 or 8 butyl naphthyl)triphosphate, Adenosine-5'-(γ -4-phenyl)-(γ' -4
80 aminophenyl)triphosphate, Adenosine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -3-
81 aminopropyl) triphosphate, Guanosine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -4-
82 aminobutyl) triphosphate, Cytosine-5'-(γ -methyl) triphosphate Adenosine-5'-(γ -cyclohexyl)
83 triphosphate, Thymidine-5'-(γ -methyl) triphosphate Adenosine-5'-(γ -2-carboxyethyl)
84 triphosphate, Uracil-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -3-
85 carboxypropyl)triphosphate, 3'-azido-3'-deoxythymidine-5'-(7-methyl) triphosphate,
86 Adenosine-5'-(γ -4-carboxybutyl) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'-(γ -
87 methyl) triphosphate, Adenosine-5'-(γ -2-hydroxyethyl) triphosphate, 2',3'-didehydro-2',3'-
88 dideoxythymidine-5'-(γ -methyl)triphosphate, Adenosine-5'-(γ -3-hydroxypropyl)
89 triphosphate, Adenosine-5'-(γ -ethyl) triphosphate, Adenosine-5'-(γ -propyl) triphosphate,
90 Adenosine-5'-(γ -4-hydroxybutyl) triphosphate, Adenosine-5'-(γ -4-butyl) triphosphate,
91 Adenosine-5'-(γ -2-nitroethyl) triphosphate, Adenosine-5'-(γ -hexyl) triphosphate,
92 Adenosine-5'-(γ -3-nitropropyl) triphosphate, Adenosine-5'-(γ -isopropyl) triphosphate,

93 Adenosine-5'- (γ -4-nitrobutyl) triphosphate, Adenosine-5'- (γ -tert-butyl) triphosphate
94 ,Adenosine-5'- (γ -methyl)- (γ' -ethyl)triprophosphate, Adenosine-5'- (γ -cyclohexyl) triphosphate,
95 Adenosine-5'- (γ -2-aminoethyl)triphosphate, and Adenosine-5'- (γ -methyl)- (γ' -propyl)
96 triphosphate.

1 47.(new) The kit of claim 15, wherein the polymerizing agent is selected from the group
2 consisting of naturally occurring or synthetic polymerases and reverse transcriptases.